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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/990,542	11/20/2001	Charles Gregory Nelson	18973-69 (P00-3518)	2595

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EXAMINER

SHRADER, LAWRENCE J

ART UNIT	PAPER NUMBER
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2193

DATE MAILED: 06/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/990,542

Applicant(s)

NELSON, CHARLES GREGORY

Examiner

Lawrence Shrader

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 April 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17, 20 - 32, 34 - 39, and 41 - 45 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17, 20 - 32, 34 - 39, and 41 - 45 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This Office Action is in response to the amendment filed on 4/07/2005.
2. Original claims 36 – 38; and 39 remain rejected; new claims 42 – 45 are also rejected. Claims 1 – 8, 20; 9 – 17, 21; 22 – 32, 34, 35 are allowed. New claims 41, 46, and 47 are also allowed.
3. Claims 18, 19, 33, and 40 have been cancelled.

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. The rejection of claim 22 under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter is withdrawn in view of the amendments. Claim 18 has been withdrawn as requested by the Applicant.

6. Claims 36, 39, and 44 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The Federal Circuit has recently applied the practical application test in determining whether the claimed subject matter is statutory under 35 U.S.C. § 101. The practical application test requires that a “useful, concrete, and tangible result” be accomplished. An “abstract idea” when practically applied is eligible for a patent. As a

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consequence, an invention, which is eligible for patenting under 35 U.S.C. § 101, is in the “useful arts” when it is a machine, manufacture, process or composition of matter, which produces a concrete, tangible, and useful result. The test for practical application is thus to determine whether the claimed invention produces a “useful, concrete and tangible result.”

Claims 36 and 39 recite a code generation tool, which is software, without embodiment in a tangible system. Although the second limitation of each claim indicates that the operators are computable in a computer system, this is merely a potential condition. Potentially computable software is not necessarily embodied in a tangible computer. This rejection can be overcome by claiming with language consistent with the specification, e.g., “A code sequence generation tool for automatic generation of a near-optimal code sequence executable on a computer, comprising:” The claims, as recited, amounts to an abstract idea failing to suggest an application with a tangible embodiment leading to a concrete and tangible result. Thus, the claim fails to fulfill the requirements of the practical application test and is rejected for leading to a non-statutory subject matter.

Claim 44 recites a method of producing code in which the steps do not necessarily require or strongly suggest evidence that some hardware or tangible embodiment is being used because the steps can be done by virtual analysis or algorithmic computations. The claim, as recited, amounts to an abstract idea failing to suggest an application with a tangible embodiment leading to a concrete and tangible result. Thus, the claim fails to fulfill the requirements of the practical application test and is rejected for leading to a non-statutory subject matter. Language suggested for claims 36 and 39 should be incorporated to overcome the rejection.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

8. The rejections of claims 1; 22; 36; and 39 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention have been withdrawn in view of the amendments. Claims 18 and 40 have been withdrawn as requested by the Applicant.

Allowable Subject Matter

9. Claims 1, 9, 22, and 46 are allowed.

The following is an examiner's statement of reasons for allowance:

Claim 1:

Prior art of record taken either singly and/or in combination, does not teach or disclose a method as recited in independent claim 1 with the following features:

Repeatedly invoking an automatic theorem prover for plural cycle budgets in order to determine a minimum cycle budget, that is the lowest of any cycle budget K for which a formalized mathematical conjecture is unprovable by the automatic theorem prover (that no code sequence for the target computer architecture executes the program fragment within the cycle budget K); and then extract the near optimal code sequence from a counterexample implicit in the failed proof of the formalized mathematical conjecture for the minimum cycle budget.

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Thus all remaining dependent claims 2 – 8, and 20 are also allowed.

Claim 9:

Prior art of record taken either singly and/or in combination, does not teach or disclose a method as recited in independent claim 9 with the following features:

While repeatedly invoking a theorem prover to prove unsatisfiable a formalized mathematical conjecture, no code sequence in a program fragment executes within a cycle budget K:

If the proof fails, a K-cycled program computing the program fragment is embedded in the failed proof,

Wherein, if the near-optimal code sequence is found, and the invocation need not be repeated, when it is established that the K-cycled program computes the program fragment and a cycle budget K-1 is insufficient, the K-cycled program is extracted as the near-optimal code sequence,

wherein, if the near-optimal code sequence is not found, for a next revocation of the automatic theorem prover if the proof succeeds the budget K is doubled; if the proof fails the proof is bisected ($K := K/2$) and a new K-cycled program computing the fragment that is embedded in the failed proof is extracted.

Thus all remaining dependent claims 10 – 17, and 21 are also allowed.

Claim 22:

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Prior art of record taken either singly and/or in combination, does not teach or disclose a method as recited in independent claim 46 with the following features:

Applying automatic theorem-proving to a code sequence generator introducing a multi-assignment to the code sequence generator; based on the multi-assignment, producing with the code sequence generator a number of possible plans for creating the near-optimal code sequence; then selecting an optimal plan from among the possible plans for automatically producing the near-optimal code sequences wherein performing the planning with the satisfiability search is repeated a plurality of times for plural machine cycle budgets to find the optimal plan associated with a predetermined machine cycle budget.

Thus all remaining dependent claims 23 – 32, 34, 35, and 41 are also allowed.

Claim 46:

Prior art of record taken either singly and/or in combination, does not teach or disclose a computer-readable medium embodying code as recited in independent claim 46 with the following features:

Inputting, to a code sequence generator, expressions corresponding to a fragment of program code, and generating a data structure representing plural ways of computing the input expressions; then performing a satisfiability search by the code sequence generator to select one of the ways as an optimal solution associated with a minimum machine cycle budget, the optimal solution corresponding to the near-optimal code sequence.

Thus the remaining dependent claim 47 is also allowed.

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lawrence Shrader whose telephone number is (571) 272-3734. The examiner can normally be reached on M-F 08:00-16:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kakali Chaki can be reached on (571) 272-3719. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Lawrence Shrader
Examiner
Art Unit 2193

22 June 2005

Kakali Chaki
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